

CLAIMS

What is claimed is:

1. A method of generating a distance map comprising the steps of:
 - a) identifying a boundary curve of a source image; and
 - b) assigning a distance value to each pixel of the distance map associated with a corresponding region of the source image, wherein for each pixel, the distance value represents a distance between a center of that pixel and a nearest point of the boundary curve, wherein the nearest point is located to sub-pixel accuracy.
2. The method of claim 1 wherein step a) further comprises the steps of:
 - i) generating an unsigned graylevel image corresponding to the source image; and
 - ii) applying a threshold value to the unsigned graylevel image to form a signed graylevel image, wherein a sign change between graylevel values of adjacent pixels indicates a boundary curve intersection, wherein the sign change identifies the adjacent pixels as boundary pixels.
3. The method of claim 2 wherein step b) further comprises the step of:
 - i) calculating a distance from a center of each boundary pixel to a nearest interpolated boundary curve intersection as the distance value for boundary pixels; and
 - ii) propagating distance values from each pixel to adjacent pixels to generate an unsigned interim distance map.

4. The method of claim 3 wherein for each selected pixel, m_i = the minimum of the distance values of the neighboring pixels above and below the selected pixel, wherein m_j = the minimum of the distance values of the neighboring pixels to the left and right of the selected pixel, wherein h corresponds to a pixel size, wherein T_{ij} = a current distance value for the selected pixel, wherein a proposed update value, u , is assigned a value as follows:

$$u = \frac{m_i + m_j + \sqrt{2h^2 - (m_i - m_j)^2}}{2}, \text{ if } |m_i - m_j| < h \text{ otherwise } u = \min(m_i, m_j) + h,$$

wherein T_{ij} is updated to $\min(T_{ij}, u)$.

5. The method of claim 3 wherein step b) includes the step of performing each of the following passes to propagate the distance information throughout the image: top-to-bottom and left-to-right, top-to-bottom and right-to-left, bottom-to-top and left-to-right, bottom-to-top and right-to-left.

6. The method of claim 3 wherein step b)(ii) further comprises the step of assigning a sign of each pixel of the signed graylevel image to the distance value in the corresponding location of the unsigned interim distance map to generate a signed first distance map.

7. The method of claim 6 further comprising the step of:

c) downsampling the first distance map to generate a second distance map having a second resolution.

1 14. The method of claim 12 further comprising the steps of:
2 c) interpolating the second distance map to generate an
3 interpolated distance map having the first resolution; and
4 d) applying a soft threshold filter to the interpolated distance
5 map to generate a reconstructed source image having the first resolution.

1 15. The method of claim 12 wherein the first resolution is greater than
2 the second resolution.

1 16. The method of claim 12 wherein step a) further comprises the steps
2 of:
3 i) identifying at least one boundary curve of the source image;
4 and
5 ii) assigning a distance value to each pixel of the first distance
6 map, wherein each pixel is associated with a region of the source image,
7 wherein for each pixel, the distance value represents a distance between a
8 center of that pixel and a nearest point of a nearest boundary curve,
9 wherein the nearest point is located to sub-pixel accuracy.

1 17. The method of claim 16 wherein step (a)(i) further comprises the
2 step of applying a threshold value to a graylevel rendering of the source
3 image to form a signed graylevel image, wherein a sign change between
4 graylevel values of adjacent pixels indicates a boundary curve lies between
5 centers of the adjacent pixels, wherein the sign change identifies the
6 adjacent pixels as boundary pixels.

